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(54) Screw-type anchor

(57) A self-tapping masonry anchor includes an axial bore that is formed at one end and extends through a portion of the anchor.

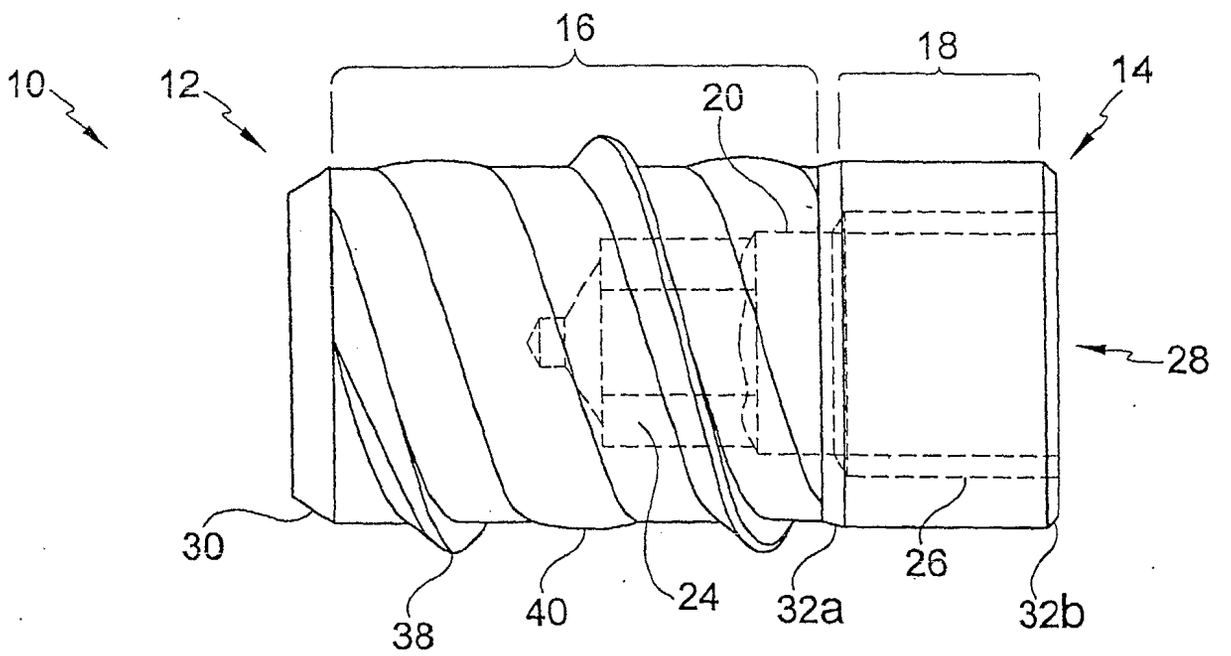

FIG.1

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Description

[0001] The invention relates to a self-tapping masonry anchor for support structure, such as fixtures.

BACKGROUND OF THE INVENTION

[0002] Self-tapping masonry anchors are known in the art. One example of a self-tapping masonry anchor is disclosed in U.S. Pat No. 4,973,210. This anchor has a cutting shaft 6 with an externally threaded fastening portion 5 (or a fastening portion 10 having an internally-threaded bore 11) and a cutting portion 6 having a raised external helix 7. The anchor is secured in a masonry hole by first forming a hole in the masonry and then driving the cutting portion 6 into the hole using an oscillatory rotating hammer blows. A key may be driven into a longitudinal slot 12 passing through the concrete, masonry or brickwork along a line of interruption in the raised helix embedded in the hole which is said to prevent the fastening from rotating or from being removed from the hole.

[0003] It would be desirable to have a self-tapping masonry anchor in which the anchor is securable in masonry by releasable engagement with a tool received within a bore of the anchor such that the tool may be easily removed from the bore after inserting the anchor in the masonry. It would also be desirable to have an anchor in which the external cutting thread is disposed within close proximity of the portion of the anchor in which an axial bore extends so that the anchor has a relatively short longitudinal extent, is securable in a relatively shallow hole and/or is secured with its exposed end flush with, or recessed within a masonry hole.

SUMMARY OF THE INVENTION

[0004] The above needs are met, and the shortcomings of prior art are overcome by the anchor of the invention. According to one embodiment, the anchor includes a helical thread of the type suited for tapping masonry, the thread extending from a first end to a first intermediate station disposed between the first and a second end of the anchor, an axial bore adapted for releasably engaging an anchor inserting tool, the bore being formed at the second end, extending into the anchor and terminating at a second intermediate station that is one of approximately coincident with the first intermediate station and between the first intermediate station and the first end. In this embodiment, the anchor may include a second engagement formed on the wall of the bore, the second engagement being disposed between the tool engagement and the second end and the tool engagement may correspond to a hex-type engagement.

[0005] In another embodiment, a method for forming a self-tapping masonry anchor from a cylindrical blank includes the steps of forming an axial bore extending from a first end and terminating at a first intermediate station disposed between the first end and a second end, and forming a thread by rolling, the thread extending from the second end to a second intermediate station, the second intermediate station being one of approximately coincident with the first intermediate station and between the first intermediate station and the first end. The bore may be cold forged, and the piece may be tapped by a cold rolling process.

[0006] In another embodiment, a method for inserting a self tapping masonry anchor in a masonry hole includes the steps of driving the anchor into the masonry hole until a second, exposed end is one of approximately flush with the hole opening and disposed below the hole opening, and then removing the tool from the bore. In this embodiment, a tool is inserted into a bore and engaged with the bore walls. The piece is then driven into the hole and then removed by pulling the tool straight out of the bore. Such a tool engagement may correspond to a female-hex.

[0007] In another embodiment, an anchor for coupling a mounting structure to masonry includes a solid portion that extends from a first end of the anchor and terminates at an intermediate station located between the first and a second end of the anchor, a hollow portion defined by an axial bore extending from the second end to the intermediate station, wherein a first bore portion defines a tool engagement for releasably engaging an anchor inserting tool, a second bore portion for releasably securing a structure to the anchor, and a helical thread of the type suited for tapping masonry, the thread extending over a length that is no less than approximately the longitudinal extent of the solid portion.

[0008] Additional features and advantages of the invention will be set forth or be apparent from the description that follows. The features and advantages of the invention will be realized and attained by the structures and methods particularly pointed out in the written description and claims hereof as well as the appended drawings.

[0009] It is to be understood that both the foregoing general description and the following detailed description are exemplary and explanatory and are intended to provide further explanation without limiting the scope of the invention as claimed.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] The accompanying drawings, which are included to provide a further understanding of the invention, are incorporated in and constitute a part of this specification, illustrate preferred embodiments of the invention and together with the description serve to explain the principles of the invention. In the drawings:

FIG. 1 is a planar view of a first embodiment of a self-tapping masonry anchor made in accordance with the principles of the invention.

FIG. 2 is top view of the anchor of FIG. 1.

FIG. 3 is a planar cross-section view of the anchor of FIG. 1, taken at section III-III of FIG. 2.

FIG. 4 is a planar view of the anchor of FIG. 1 embedded in masonry.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0011] Anchors according to the invention will now be described in detail with frequent reference to preferred embodiments, such as anchor 10 illustrated in FIGS. 1-4. The invention is concerned with self-tapping masonry anchors that are securable in a pre-bored masonry hole. Once secured in the hole, the anchor may then be used to support structure, such as a pipe hanger, utility tray, ducts, lighting system, sprinkler system, electrical system, drop ceiling or refrigeration system. The anchor may be secured in a masonry hole of varying depth or diameter, have a varying length threading and may be formed to accommodate common fasteners for attaching structure, e.g., threaded fasteners, or even a custom fitting without departing from the scope of invention. In one embodiment, the exposed end of the anchor (i.e., the end that receives the mating structure) may be flush with the masonry surface, as in the example illustrated in FIG. 4. In other embodiments, the anchor may be sunken into the masonry hole or extend out from the hole.

[0012] Referring now to a preferred embodiment illustrated in FIGS. 1-4, anchor 10 is formed from a generally cylindrical stock metal and includes an external threaded portion 16 extending from a forward end 12 of anchor 10. An upper portion 18 extends from threaded portion 16 to fastening end 14. Anchor 10 includes a solid portion 34 and a hollow portion 36 whose longitudinal extent is defined by the length of a bore 20 extending from fastening end 14 towards forward end 12. Threaded portion 16 may extend over hollow portion 36, in addition to solid portion 34. Referring to FIGS. 2 and 3, bore 20 may be generally circular and includes a tool fitting 24 at one end and a fixture attachment 26, e.g., a helical thread 26a, at the opposite end adjacent opening 28 of bore 20.

[0013] A camfer 30 may be formed at forward end 12 to assist with aligning anchor 10 with the masonry hole. Camfers 32a, 32b are also preferably formed at fastening end 14 and at the junction of threaded portion 16 and upper portion 18. Referring to FIG. 3, which illustrates a cross-sectional slice of anchor 10 taken at section III-III in FIG. 2, tool fitting 24 is preferably formed into tool engagement surfaces that will reliably sustain high localized stresses resulting from torques applied by an anchor inserting tool, e.g. an oscillatory rotating hammer, hammer drill or impact wrench, as anchor 10 is driven into the masonry hole. In a preferred embodiment, tool fitting 24 corresponds to a female hex-type tool engagement, walls 24a, 24b, and 24c of which may be formed as shown in FIG. 3 . A hex-type fitting is preferred as it is a common type of tool engagement. In other embodiments, tool fitting 24 may correspond to other types of engagements characterized by, e.g., longitudinally extending, opposed planar walls of appropriate depth for reacting torques required to tap masonry. It is preferred to have longitudinally extending so that the tool may be easily removed from bore 20 after anchor 10 is inserted into the masonry hole. In cases where, for example, tool fitting 24 is a helical thread, the tool may become locked in the bore. For this reason, it may be desirable to avoid using a helical thread for tool fitting 24. But it is not considered limiting on the invention that a particular type of tool engagement is used over another.

[0014] Threaded portion 16 is of the type that is suitable for self-tapping masonry, as opposed to soft material (e.g., wood, plastic) or metal. Examples of thread patterns suited for tapping masonry are described in U. S. Pat. No. 6,419,435 to Gaudron and U.S. Pat. No. 5,957,6363 to Giannuzzi et al., the entire contents of which are incoporated by reference in their entirety for all purposes. In a preferred embodiment, threaded portion 16 includes a helical cutting thread 38, land 40, preferably formed as an arcute, e.g., hemispherical, land, and a valley disposed between land 40 and cutting thread 3 8 and defining a root diameter of the threading. As described in the above references, as a self-tapping masonry anchor is driven into masonry, the debris accumulated from cutting into this friable material compacts in a compaction zone disposed between success rows of the cutting thread. This compacted debris creates a frictional resistance between the anchor and the wall of the hole, which resists dislodgment of the anchor from the hole. Embodiments of the invention may have a hemishperical or planar land disposed between valleys which may be defined by a root diameter. The land may have a diameter that is equal to, or slightly less than the diameter of the hole so as to promote a frictional resistance between the anchor and the hole wall. Other types of masonry thread patterns may alternatively be used in place of the thread designs disclosed above. Accordingly, the invention is not limited to a particular type, or variety of self-tapping masonry thread.

[0015] The cutting thread of the anchor, e.g., thread 38, may define a maximum diameter of the anchor, such as when the anchor is designed to be driven into a constant diameter hole and the exposed end, e.g., fastening end 14, is flush with, or disposed below the masonry surface when the anchor is fully inserted into the hole. The maximum diameter of upper portion 18 is preferably sized to be the same as, or slightly less than the diameter of the masonry hole so that fastening end 14 may be positioned within the masonry surface. Land 40 may be sized to have a maximum diameter extent that is equal to, or slightly greater than the maximum diameter of upper portion 18.

[0016] Bore 20 preferably has a stepped diameter, with tool fitting 24 having a diameter that is slightly less than than the outer diameter of fixture attaching portion 26. A helical thread is preferably formed along the wall surface of fixture attaching portion 26 for engagement with a mating helical thread of the connecting structure. Other types of fastener engagements may be used in place of a helical thread.

[0017] Referring to FIG. 4, anchor 10 is shown embedded in masonry 50 and engaged with walls 54 defining a pre-formed hole. In this preferred embodiment, hole has a depth that allows fastening end 14 to be positioned approximately flush with surface 52. Cutting thread 38 is engaged with walls 54 and the diameter of upper portion 18 is approximately the same diameter as the hole.

[0018] A preferred method for forming an anchor according to the invention uses cold forging. The steps include forming the bore of the anchor by drawing the piece using a punch press, followed by a second tool that taps the outer surface using a rolling pin. The Fixture attaching portion, e.g., a helical thread, is then formed along an inner wall of the bore.

[0019] Although the foregoing description is directed primarily to preferred embodiments of the invention, it is noted that other variations and modifications will be apparent to those skilled in the art, and may be made without departing from the spirit or scope of the invention.

Claims

1. An integrally formed, self tapping masonry anchor having a length extending between a first end and second end of the anchor, the anchor being insertable in a masonry hole using a tool, comprising:

   a helical thread of the type suited for tapping masonry, the thread extending from the first end to a first intermediate station disposed between the first and second ends;

   an axial bore adapted for releasably engaging an anchor inserting tool, the bore being formed at the second end, extending into the anchor and terminating at a second intermediate station that is one of approximately coincident with the first intermediate station and between the first intermediate station and the first end.

2. The anchor of claim 1, further including a fastner engagement disposed between the tool engagement and the second end.

3. The anchor of claim 2, wherein the fastner engagement is formed on a bore wall.

4. The anchor of claim 1, wherein the second intermediate station is between the first intermediate station and the first end and at least a substantial portion of a tool engagement, formed in the bore, is located between the first intermediate station and the first end.

5. The anchor of claim 1, further including a female hex for engaging the tool.

6. A method for forming a self-tapping masonry anchor from a cylindrical blank, the blank having a first and second end defining a longitudinal extent of the blank, comprising the steps of:

   forming an axial bore extending from the first end and terminating at a first intermediate station disposed between the first and second ends; and

   forming a thread by rolling, the thread extending from the second end to a second intermediate station, the second intermediate station being one of approximately coincident with the first intermediate station and between the first intermediate station and the first end.

7. The method of claim 6, wherein the forming an axial bore step includes the step of cold forging the axial bore.

8. A method for inserting a self tapping masonry anchor in a masonry hole having a hole opening, the masonry anchor having formed thereon a helical threading of the type suited for tapping masonry, the anchor having first and second ends defining the longitudinal extent of the anchor, and an axial bore is formed in the anchor, comprising the steps of:

   engaging an anchor inserting tool with the bore;

   driving the anchor into the masonry hole until the second end is one of approximately flush with the hole opening and disposed below the hole opening; and

   removing the tool from the bore including pulling the tool out of the bore.

9. The method of claim 8, wherein the enagaging step includes engaging the tool with at least a portion of the bore that is devoid of a helical thread.

10. The method of claim 8, wherein the engaging step includes engaging a hex-shaped portion of the bore with the tool.

11. The method of claim 8, further including the step of attaching a structure to the anchor by engagement

of a second engagement of the anchor with a corresponding mating portion of the structure.

12. The method of claim 11, wherein the attaching a structure step includes attaching the structure to a second engagement formed in the bore.

13. The method of claim 8, wherein the engaging step includes the step of pushing the tool into locking engaging with the bore.

14. A masonry anchor that is embedded in a hole, comprising:

a first anchor portion including a helical threading formed thereon, the thread being embedded in a helical groove of the hole formed by the thread as the anchor is driven into the hole by the tool; and

a second anchor portion extending from the first portion to a location that is one of approximately flush with and recessed within the masonry hole, the second portion having formed therein an axial bore including a plurality of axially extending, opposed planar walls for releasably engaging a tool.

15. The anchor of claim 14, wherein the hole is preformed as a hole having a constant hole diameter, the helical threading has a thread defining a major threading diameter, and the second anchor portion has a constant outer diameter that is less than the maj or threading diameter and approximately equal to the hole diameter.

16. The anchor of claim 14, wherein the plurality of longitudinally extending, opposed planar walls is a female hex.

17. An anchor for coupling a mounting structure to masonry by engagement of a fastener of the mounting structure to the anchor, the anchor having first and second ends defining a longitudinal extent of the anchor, comprising:

a solid portion extending from the first end and terminating at an intermediate station located between the first and second ends;

a hollow portion defined by an axial bore extending from the second end to the intermediate station, wherein a first bore portion defines a tool engagement for releasably engaging an anchor inserting tool, and a second bore portion for releasably securing a structure to the anchor; and

a helical thread of the type suited for tapping masonry, the thread extending over a length that is no less than approximately the longitudinal extent of the solid portion.

18. The anchor of claim 17, wherein no more than approximately 30% of the longitudinal extent of the anchor corresponds to the solid portion.

19. The anchor of claim 18, wherein the threading extends over at least 60% of the longitudinal extent of the anchor.

20. The anchor of claim 17, wherein the helical thread is a forged helical thread.

21. An integrally formed, self-tapping masonry anchor having a length extending between a first end and second end of the anchor, the anchor being insertable in a masonry hole using a tool, comprising:

thread means of the type suited for tapping masonry, and an axial bore adapted for releasably engaging an anchor moving tool, the thread means extending from the first end to a first intermediate station disposed between the first and second ends; and
the bore being formed at the second end, extending into the anchor and terminating at a second intermediate station that is between the first intermediate station and the first end.

22. A method of forming a self-tapping masonry anchor from a cylindrical blank, the blank having first and second ends defining a longitudinal extent of the blank, comprising the steps of:

forming a thread by rolling, the thread extending from the first end to a first intermediate station, the first intermediate station being located between the first and the second end is of the blank, and
forming an axial bore extending from the second end and terminating at a second intermediate station disposed between the first end and the first intermediate station.

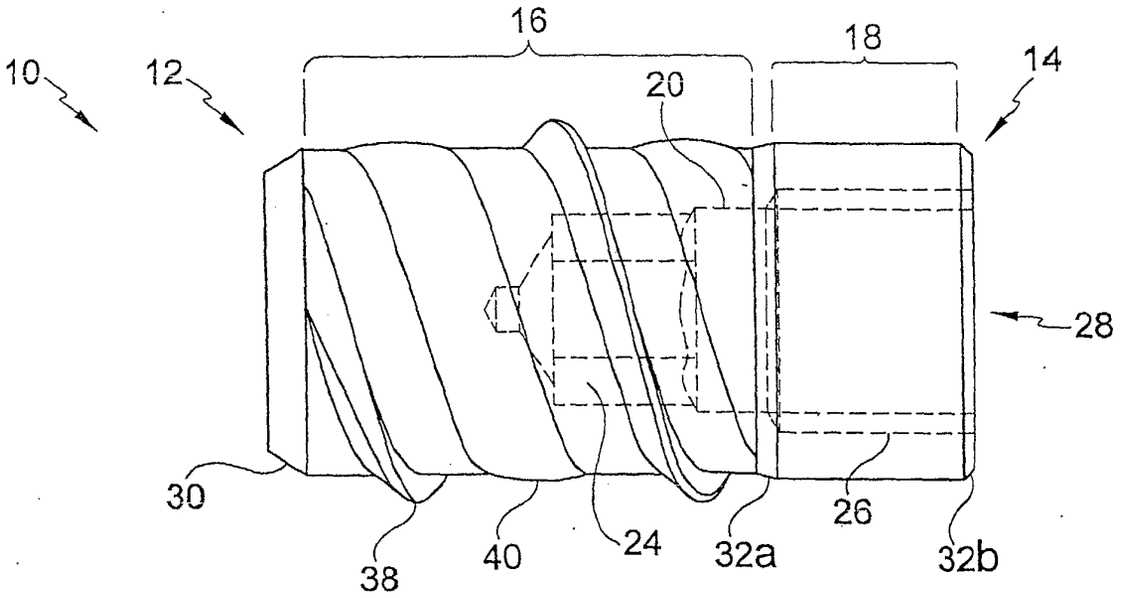

FIG.1

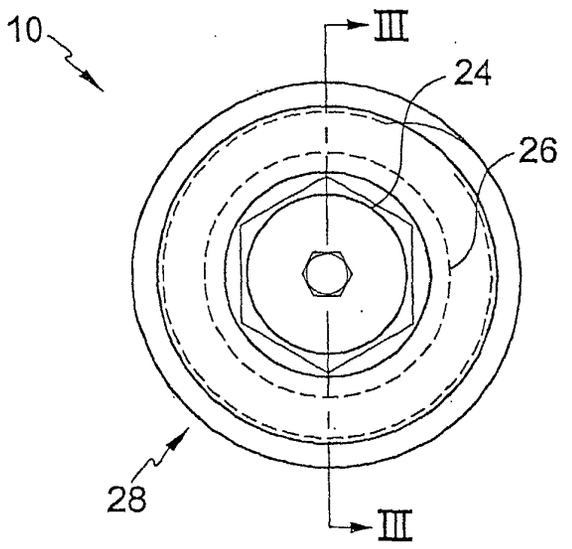

FIG.2

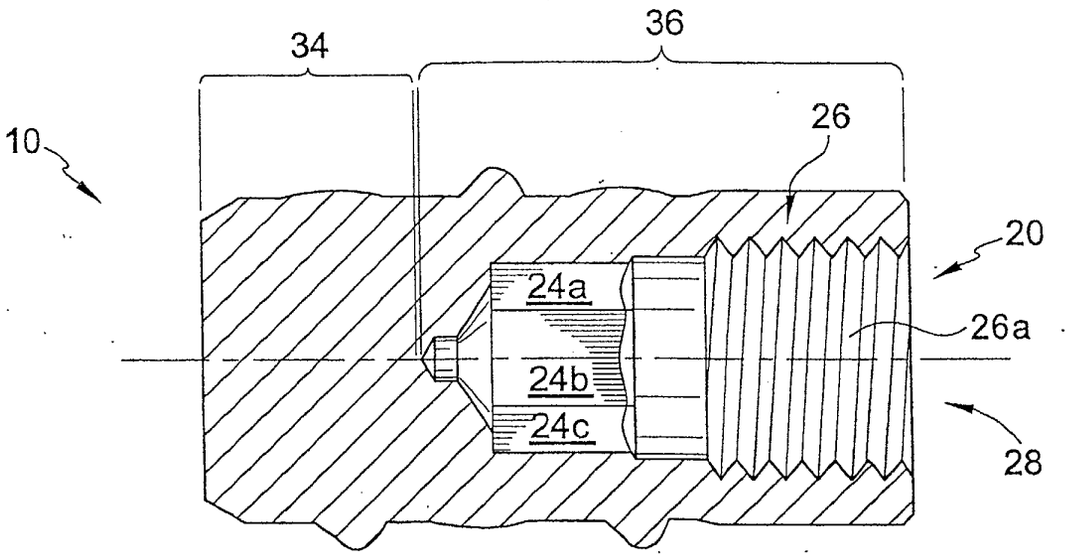

FIG.3

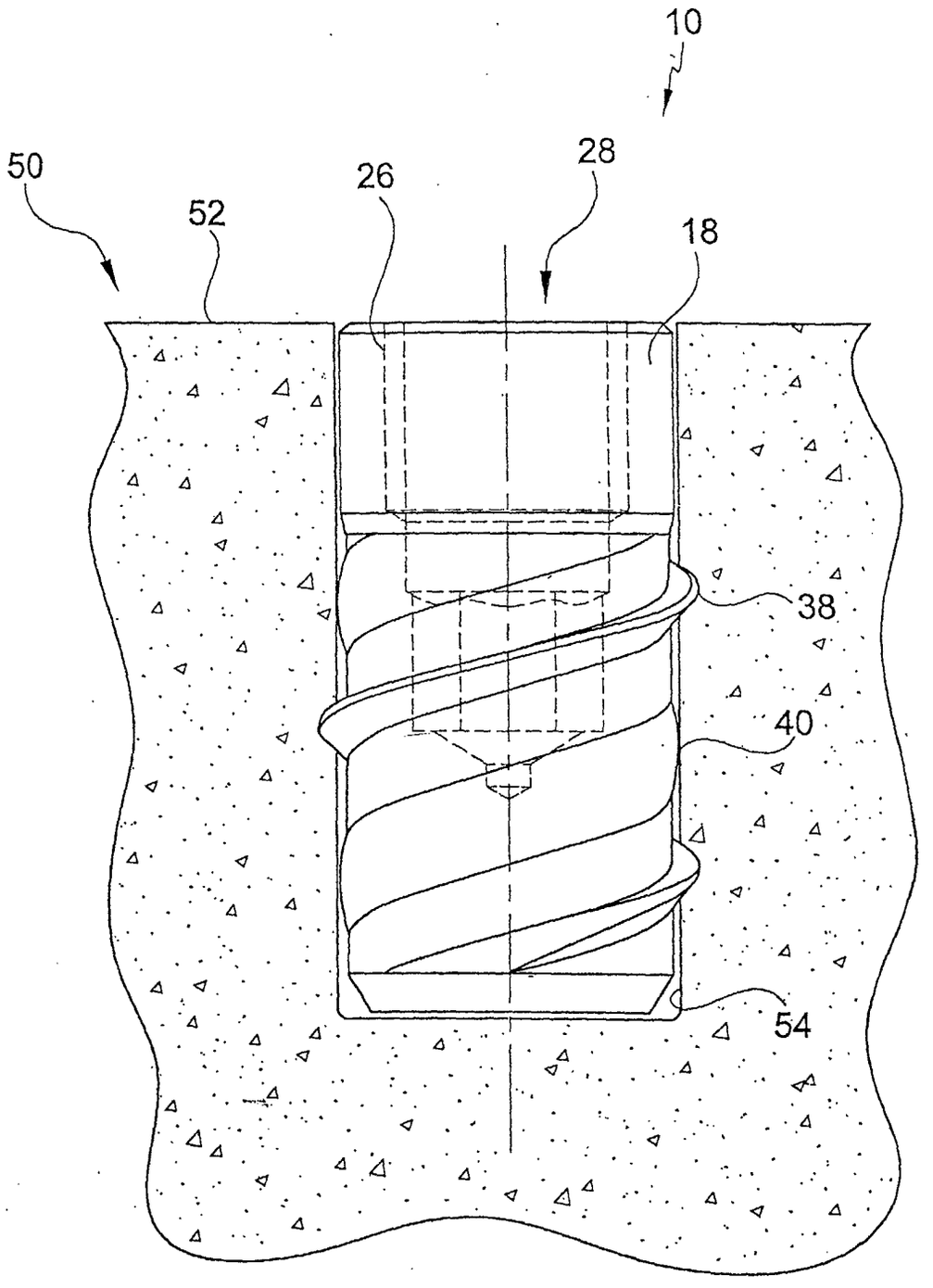

FIG.4